

**REMARKS**

Applicants have received and reviewed a final Office Action dated December 17, 2002. By way of response, Applicants have cancelled claim 30, amended claims 1-3, 9 and 29, and added new claims 33-74. No new matter is presented. Claims 1-9, 29 and 31-74 are pending. Applicants submit that the pending claims are supported by the specification.

The newly presented claims generally correspond to the previously pending claims as follows. Newly presented claim 33 includes subject matter of claims 1 and 4. Newly presented claim 42 includes subject matter of claims 1 and 9. Newly presented claim 48 includes subject matter of claims 29 and 31. Newly presented claim 50 includes the subject matter of claims 29 and 32. Newly presented claims 52 and 60 are straight composition claims generally patterned after claim 1. Claim 60 recites photoreactive group. Newly presented claim 67 includes the subject matter of claim 1 and recites photoreactive group.

In the pending claims, Applicants intend that the singular include the plural.

For the reasons given below, Applicants submit that the pending claims are in condition for allowance and notification to that effect is earnestly solicited.

**Priority Claim**

In the Office Action mailed January 15, 2002, the Examiner asserted that for the purposes of prior art, present claims 1-10 are denied 35 U.S.C. § 120 priority and are afforded the date of March 9, 2000. Applicants respectfully disagree. Applicants submit that the present claims are entitled to priority to the parent and grandparent applications to the fullest extent applicable.

In particular, the Examiner asserts that the invention claimed in the present application and relating to a polyepoxide containing reagent composition is not supported by either the parent or the grandparent application. Applicants respectfully disagree.

**Parent Application**

Parent application 09/227,913 became United States Patent 6,465,178 (the '178 patent). At least at the paragraph bridging columns 3 and 4, the '178 patent states that the "reagent composition of the invention contains one or more thermochemically reactive groups ... . Suitable groups are selected from ... epoxide ... groups." Claim 1 of the '178 patent recites "a bound composition of a reagent composition, the bound composition comprising a polymeric backbone

having more than one pendant thermochemically amine-reactive or sulphydryl-reactive groups ...". Claim 8 of the '178 patent specifically recites that the "pendant thermochemically reactive groups are selected from ... epoxides ... ." Claims 9 and 16 of the '178 patent contain similar recitations.

Thus, the parent application both discloses and claims compositions including one or more thermochemically reactive epoxide groups. The parent application provides disclosure supporting and enabling claims relating to a polyepoxide containing reagent composition. Therefore, the parent application meets the standards of 35 U.S.C. § 112, first paragraph, for the present claims reciting a "reagent composition comprising: a copolymer of a mixture of monomers, the monomers comprising: one or more monomers having pendant epoxy group".

Further, the parent application also meets the standards of 35 U.S.C. § 112, first paragraph, for the present claims by providing ample disclosure of features such as support surfaces, photoreactive groups, nucleic acids, hydrophilic polymers, immobilization of polymers on surfaces, polymeric backbones, other thermochemically reactive groups, methods of preparing functionalized polymers, and other features of the presently claimed invention.

The parent application has been incorporated by reference into the present application. Therefore, the entire disclosure of the parent application forms a part of the present application and can be fully relied upon. The present Summary of the Invention refers to the comprehensive nature of the disclosure of the parent application and its particular disclosure of reagents including epoxide groups.

Applicants recognize that the present application discloses certain specific epoxide structures not literally disclosed in the parent application. The present application is a continuation in part application.

### **Grandparent Application**

Grandparent application 08/940,213 became United States Patent 5,858,653 (the '653 patent). This patent also relates to reagent compositions including polymers and thermochemically reactive groups that are suitable for immobilizing molecules such as nucleic acids on a support surface.

The reagent composition of the grandparent application can include a polymeric backbone bearing "one or more thermochemically reactive groups useful for forming a covalent

bond with the corresponding reactive group of the target molecule" (the '653 patent at least at column 4, lines 5-12). The grandparent patent includes, supports, and enables claims to reagent compositions including "one or more thermal chemically amine-reactive or sulphydryl-reactive groups" (see, e.g., claim 1 of the '653 patent). At least at column 7, lines 19-34, the grandparent patent indicates that suitable thermochemically reactive groups include epoxides.

The grandparent application both discloses and claims compositions including one or more thermochemically reactive groups. The grandparent application discloses thermochemically reactive epoxide groups. The grandparent application provides disclosure supporting and enabling claims relating to a polyepoxide containing reagent composition. Therefore, the grandparent application meets the standards of 35 U.S.C. § 112, first paragraph, for the present claims reciting a "reagent composition comprising: a copolymer of a mixture of monomers, the monomers comprising: one or more monomers having pendant epoxy groups".

Further, the grandparent application also meets the standards of 35 U.S.C. § 112, first paragraph, for the present claims by providing ample disclosure of features such as support surfaces, thermochemically reactive groups, photoreactive groups, hydrophilic polymers, nucleic acids, polymeric backbones, immobilization of polymers on surfaces, methods of preparing functionalized polymers, and other features of the presently claimed invention.

The grandparent application has been incorporated by reference into the present application. Therefore, the entire disclosure of the parent application forms a part of the present application and can be fully relied upon.

Applicants recognize that the present application discloses certain specific epoxide structures not literally disclosed in the grandparent application. The present application is a continuation in part application.

### Conclusion

The parent and grandparent applications comply with 35 U.S.C. § 112, first paragraph, for their disclosure of reagent compositions including polymers with pendant thermochemically reactive epoxide groups, and also features such as support surfaces, photoreactive groups, nucleic acids, hydrophilic polymers, immobilization of polymers on surfaces, polymeric backbones, other thermochemically reactive groups, methods of preparing functionalized polymers, and other features of the presently claimed invention. Therefore, claims of the present

invention relating to such features are entitled to priority back to the filing date of the grandparent application, September 30, 1997.

**Rejection of Claims Under § 102(b) or § 103(a)**

The Examiner rejected claims 1-3, 5-8, 29, and 30 under 35 U.S.C. § 102(b) as anticipated by, or, in the alternative, under 35 U.S.C. § 103(a) as obvious over, U.S. Patent No. 4,332,694 to Kalal et al. Although this rejection has not been raised against the newly presented claims, it is discussed insofar as it might apply. Applicants respectfully traverse this rejection.

**Kalal et al. Disclose Homopolymers**

The Kalal et al. reference discloses only polymers of the following structure:

(epoxide containing monomer)<sub>n</sub>.

The Kalal et al. reference discloses homopolymers including only a single monomer, an epoxide containing monomer. The general structure of the single epoxide containing monomer making up the Kalal et al. polymer is shown by formula I (Kalal et al. column 2, lines 1-11).

According to the Kalal et al. reference, the epoxide containing monomers of Formula I have names such as 4,5-epoxy-pent-1-ene, 3,4-epoxypent-1-ene, 5,6-epoxyhex-1-ene, 8,9-epoxynone-1-ene, 1,2-epoxy-3-vinyloxypropane, 1-allyloxy-2,3-epoxypropane, 1-allyloxy-2,3-epoxybutane, 1-allyloxy-3,4-epoxybutane, 1-allyloxy-2,3-epoxy-2-methylpropane, 2,3-epoxypropylester-allylester of carbonic acid, 3,4-epoxybutyl acrylate or crotonate, 2,3-epoxy-2-ethylhexyl acrylate, allyl-9,10-epoxy stearate, 2,3-epoxypropyl sorbate, 2,3-epoxypropyl vinyl phthalate, 2,3-epoxypropyl allyl phthalate or maleate, allyl-4,5-epoxypentanoate, and allyl-5,6-epoxyhexanoate (Kalal et al. column 2, lines 51-64). Each of these listed monomers contains an epoxide group.

The examples from the Kalal et al. reference make homopolymers from epoxide containing monomers. The Examples employ epoxide containing monomers, such as 2,3-epoxypropyl methacrylate (Examples 1, 2, 4, 5, 8, and 12-22); 2,3-epoxypropyl acrylate (Example 3); 3,4-epoxybut-1-ene (Examples 7 and 8); 2,3-epoxypropyl crotonate (Example 9); 2,3-epoxybutyl acrylate (Example 10); and 2,3-epoxybutyl methacrylate (Example 11). Each of the monomers used in the Examples contains an epoxide group.

Please note that the term "2,3-epoxypropyl methacrylate" (used in Kalal et al. Examples 1, 2, 4, 5, 8, and 12-22) is a synonym of the term "glycidyl methacrylate" (used, for example, in present claim 2). This is established by accompanying Exhibit A ([http://ntp-support.niehs.nih.gov/NTP\\_Reports/NTP\\_Chem\\_HS\\_HTML/NTP\\_Chem1/Radian106-91-2.html](http://ntp-support.niehs.nih.gov/NTP_Reports/NTP_Chem_HS_HTML/NTP_Chem1/Radian106-91-2.html)). Glycidyl methacrylate is one of the monomers having pendant epoxy group recited in the present claims. Please note that the term 2,3-epoxypropyl acrylate (used in Kalal et al. Example 3) is a synonym of the term "glycidyl acrylate" (used, for example, in present claim 2). This is established by accompanying Exhibit B ([http://ntp-db.niehs.nih.gov/NTP\\_Reports/NTP\\_Chem\\_HS\\_HTML/NTP\\_Chem1/Radian106-90-1.html](http://ntp-db.niehs.nih.gov/NTP_Reports/NTP_Chem_HS_HTML/NTP_Chem1/Radian106-90-1.html)). Glycidyl acrylate is one of the monomers having pendant epoxy group recited in the present claims.

Claim 8 from the Kalal et al. reference recites a homopolymer of epoxide containing monomers. This homopolymer is a "polymer having been prepared by polymerization of a monomer selected from the group consisting of 3,4-epoxybut-1-ene, 4,5-epoxy-pent-1-ene, 3,4-epoxypent-1-ene, 5,6-epoxyhex-1-ene, 8,9-epoxynone-1-ene, 1,2-epoxy-3-vinyloxypropane, 1-allyloxy-2,3-epoxypropane, 1-allyloxy-2,3-epoxybutane, 1-allyloxy-3,4-epoxybutane, 1-allyloxy-2,3-epoxy-2-methylpropane, 2,3-epoxypropylester- allylester of carbonic acid, 2,3-epoxypropyl methacrylate, 2,3-epoxypropyl acrylate, 2,3-epoxybutyl acrylate, 2,3-epoxypropyl crotonate, 3,4-epoxybutyl methacrylate, acrylate and crotonate, 2,3-epoxy-2-ethylhexyl acrylate, allyl-9,10-epoxy stearate, 2,3-epoxypropyl sorbate, 2,3-epoxypropyl vinyl phthalate, 2,3-epoxypropyl allyl phthalate or maleate, allyl-4,5-epoxypentanoate and allyl-5,6-epoxyhexanoate" (Kalal et al. claim 8, emphasis added). Each of the monomers recited in claim 8 contains an epoxide group.

Nowhere, does the Kalal et al. reference disclose a polymer made of epoxide containing monomers and diluent monomers. Every monomer disclosed in the Kalal et al. reference includes an epoxide moiety and every polymer disclosed in this reference is made up solely of monomers including an epoxide moiety.

The above indicates that each portion of the Kalal et al. reference pointed out in an Office Action for recitation of supposed diluent monomers or asserted polymers including diluent monomers actually refers to an epoxide containing monomer or a polymer made from only monomers containing epoxide.

Several of the examples of the Kalal et al. reference disclose using azobisisobutylnitrile (AIBN), which is an initiator of polymerization reactions and not a monomer or diluent monomer.

#### **Claim 1 Recites Copolymers (or Heteropolymers)**

In contrast to the disclosure of the Kalal et al. reference, the invention of claim 1 relates to polymers of the structure:

(one or more epoxy group containing monomers)-(one or more diluent monomers)- ... ; each instance one or more epoxy group monomers can include a mixture of epoxy group monomers, each instance one or more diluent monomers can include a mixture of diluent monomers. These polymers are copolymers (heteropolymers) of monomers containing epoxy groups and of diluent monomers. The diluent monomers, according to amended claim 1 do not include epoxy groups.

Applicants believe that the diluent monomers recited in claim 1 are known to lack epoxy groups. Nonetheless, solely to advance prosecution of the present application, Applicants have amended claim 1 to recite "one or more diluent monomers or polymers lacking pendant epoxy group".

As discussed above, the Kalal et al. reference does not mention, contemplate, or suggest any such copolymers of epoxide containing monomer and diluent monomer.

Accordingly, based on the foregoing differences, it is submitted that the Kalal et al. reference cited by the Examiner neither teaches nor suggests the presently claimed reagent compositions, and withdrawal of this rejection is respectfully requested.

#### **Newly Presented Claims**

Claim 4 was not subject to this rejection. Newly presented claim 33 includes the subject matter of claim 4. Therefore, this rejection does not apply to newly presented claim 33 and its dependent claims.

Claim 9 was not subject to this rejection. Newly presented claim 42 includes the subject matter of claim 9. Therefore, this rejection does not apply to newly presented claim 42 and its dependent claims.

Claim 31 was not subject to this rejection. Newly presented claim 48 includes the subject matter of claim 31. Therefore, this rejection does not apply to newly presented claim 48 and its dependent claims.

Claim 32 was not subject to this rejection. Newly presented claim 50 includes the subject matter of claim 32. Therefore, this rejection does not apply to newly presented claim 50 and its dependent claims.

Newly presented claims 52, 60, and 67 include the recitation added to claim 1. Therefore, for the same reasons that claim 1 is free of this rejection, claims 52, 60, 67, and their dependent claims are free of this rejection.

Accordingly, based on the foregoing differences, it is submitted that the Kalal et al. reference cited by the Examiner neither teaches nor suggests the reagent compositions of the newly presented claims, and withdrawal of this rejection is respectfully requested.

### Conclusion

Based on the foregoing differences, it is submitted that the Kalal et al. reference cited by the Examiner neither teaches nor suggests the presently claimed reagent compositions, and withdrawal of this rejection is respectfully requested.

### Rejection of Claims Under § 103(a)

#### Kalal and Shi

The Examiner rejected claims 1-3, 5-8, 29, and 30 under 35 U.S.C. 103(a) as obvious over the Kalal et al reference and Shi et al. (U.S. Patent No. 5,919,626). Although this rejection has not been raised against the newly presented claims, it is discussed insofar as it might apply. Applicants respectfully traverse this rejection.

The Kalal et al. reference does not teach or suggest the presently claimed invention, as discussed above. The Kalal et al. reference discloses homopolymers of epoxide containing monomers. The presently claimed invention relates to copolymers of epoxide containing monomer and diluent monomer. The Shi et al. reference does not include the subject matter required to supplement the Kalal et al. reference.

The Shi et al. reference discloses a method for immobilizing a nucleic acid molecule to a solid substrate. A silane compound is applied to a solid substrate and cured. The silane coated

substrate is then coupled with unmodified nucleic acid molecules having either a terminal 3' OH or a terminal 5' OH. The silane can be 3-glycidoxyl propyl-trimethoxysilane. Such disclosure does not remedy the shortcomings of the Kalal et al. reference. The Shi et al. reference, either alone or in combination with the Kalal et al. reference, does not disclose or suggest the presently claimed invention.

Accordingly, based on the foregoing differences, it is submitted that the references cited by the Examiner neither teach nor suggest the presently claimed reagent compositions, and withdrawal of this rejection is respectfully requested.

Newly Presented Claims

Claim 4 was not subject to this rejection. Newly presented claim 33 includes the subject matter of claim 4. Therefore, this rejection does not apply to newly presented claim 33 and its dependent claims.

Claim 9 was not subject to this rejection. Newly presented claim 42 includes the subject matter of claim 9. Therefore, this rejection does not apply to newly presented claim 42 and its dependent claims.

Claim 31 was not subject to this rejection. Newly presented claim 48 includes the subject matter of claim 31. Therefore, this rejection does not apply to newly presented claim 48 and its dependent claims.

Claim 32 was not subject to this rejection. Newly presented claim 50 includes the subject matter of claim 32. Therefore, this rejection does not apply to newly presented claim 50 and its dependent claims.

Newly presented claims 52, 60, and 67 include the recitation added to claim 1. Therefore, for the same reasons that claim 1 is free of this rejection, claims 52, 60, 67, and their dependent claims are free of this rejection.

Accordingly, based on the foregoing differences, it is submitted that the references cited by the Examiner neither teach nor suggest the reagent compositions of the newly presented claims, and withdrawal of this rejection is respectfully requested.

**Conclusion**

Based on the foregoing differences, it is submitted that the references cited by the Examiner neither teach nor suggest the presently claimed reagent compositions, and withdrawal of this rejection is respectfully requested.

**The Swanson et al. Reference**

The Examiner rejected claims 1, 5-9, and 29-32 under 35 U.S.C. 103(a) as obvious over Swanson et al. (U.S. Pat. No. 5,942,555; herein "Swanson") and the Shi et al. reference. The Examiner rejected claims 1-9 and 29-32 under 35 U.S.C. 103(a) as obvious over the Swanson et al. reference and the Shi et al. reference as applied to claims 1, 5-9 and 29-32, and further in view of the Kalal et al. reference. Although these rejections have not been raised against the newly presented claims, they are discussed insofar as they might apply. Applicants respectfully traverse these rejections.

**The Swanson et al. Reference is Not Prior Art**

The Swanson et al. reference is a U.S. patent with a filing date of March 21, 1996 and an issue date of August 24, 1999. It appears that the Examiner has considered this reference prior art under § 102(e). The rejections note the filing date of the Swanson et al. reference. Further, this reference qualifies as prior art only under § 102(e).

A reference that is prior art only under § 102(e) cannot be used, according to § 103(c), in an obviousness rejection if the subject matter of the cited reference and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person. A clear statement of entitlement to the prior art exclusion by Applicants or a registered practitioner is a sufficient evidence to establish the prior art exclusion (Examination Guidelines for 35 U.S.C. § 102(e) (as amended and revised) at IV(5); 1266 TMOG 80, January 14, 2003).

Applicants hereby make a clear statement of entitlement to exclude the Swanson et al. reference as prior art as provided by § 103(c). The Swanson et al. patent is assigned to the assignee of the present patent application. The Swanson et al. patent and the present patent application were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

Therefore, the Swanson et al. reference is not properly considered prior art against the presently claimed invention and these rejections are rendered moot. Withdrawal of these rejections is respectfully requested.

The Swanson et al. Reference Neither Teaches Nor Suggests the Presently Claimed Invention

Applicants also maintain the arguments presented in the previous responses that the Swanson et al. and cited secondary references neither teach nor suggest the presently claimed invention.

Further, claim 4 was not subject to the rejection over the Swanson et al. reference in view of the Shi et al. reference. Newly presented claim 33 includes the subject matter of claim 4. Therefore this rejection does not apply to newly presented claim 33 and its dependent claims.

Accordingly, based on the foregoing differences, it is submitted that the references cited by the Examiner neither teach nor suggest the presently claimed reagent compositions, and withdrawal of this rejection is respectfully requested.

Rejection of Claims Under § 112, Second Paragraph

The Examiner rejected claim 30 under 35 U.S.C. 112, second paragraph. The Examiner objected to the term "hydrophilic". Claim 30 has been canceled, which renders this rejection moot.

Summary

In summary, Applicants submit that each of claims 1-9, 29 and 31-74 are in condition for allowance. The Examiner is invited to contact Applicant's undersigned representative at the telephone number listed below, if the Examiner believes that doing so will expedite prosecution of this application.

Respectfully submitted,

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Dated: Feb 14, 2003

By:

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Mark T. Skoog  
Reg. No. 40,178  
MTS:sab



MARKED-UP VERSION TO SHOW CHANGES MADE

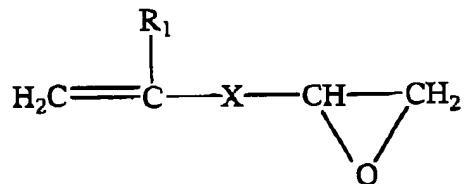
1. (Twice Amended) A reagent composition for attaching a target molecule to the surface of a substrate, the reagent composition comprising a copolymer having one or more pendant epoxy groups, the copolymer formed by reacting a mixture comprising:

- (a) one or more monomers having pendant epoxy group[s]; and
- (b) one or more diluent monomers or polymers lacking pendant epoxy group, wherein the diluent monomers or polymers comprise [are selected from the group consisting of] acrylics, vinyls, nylons, polyurethanes, [and] or polyethers[,];

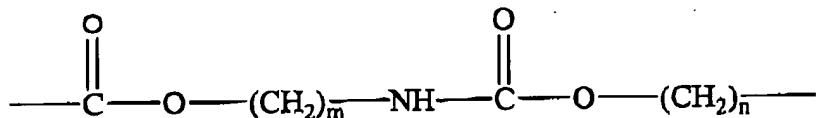
wherein the copolymer is attached to the surface of the substrate by formation of a covalent bond and the epoxy group can form a covalent bond with the target molecule.

2. (Twice Amended) A reagent composition according to claim 1, wherein the monomer having [a] pendant epoxide group [is selected from the group consisting of] comprises glycidyl acrylate, glycidyl methacrylate, allylglycidyl ether, [and] or glycidyl vinyl ether.

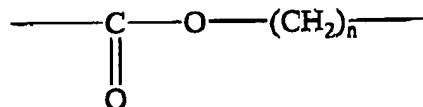
3. (Twice Amended) A reagent composition according to claim 1, wherein the monomer having a pendant epoxide group is of the formula:



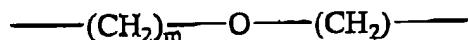
where  $R_1$  is either  $CH_3$  or  $H$  and  $X$  is a radical [selected from the group of the formula]:



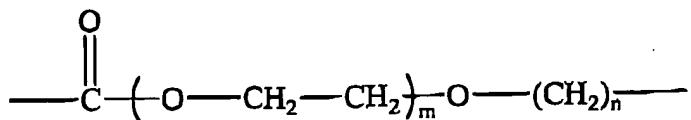
where  $m = 2-6$  and  $n = 1-10$ ;



where  $n = 1-10$



where m = 0 or 1; or



where m = 1-20 and n = 1-10.

9. (Amended) A reagent composition according to claim 8, wherein the target molecule is a nucleic acid and the one or more photoreactive groups [are selected from the group consisting of] comprise photoreactive aryl ketone[s].

29. (Amended) A reagent composition for attaching a target molecule to the surface of a substrate, the reagent composition comprising a copolymer formed by reacting a mixture comprising:

(a) one or more monomers having pendant epoxy group[s] in an amount of 5 to 25 mole percent based on the weight of the copolymer;

(b) one or more diluent monomers or polymers, wherein the diluent monomers or polymers comprise [are selected from the group consisting of] acrylics, vinyls, nylons, polyurethanes, [and] or polyethers; and

(c) one or more monomers having a photoreactive group in an amount of 0.1 to 5 mole percent based on the weight of the copolymer[,]; wherein the photoreactive group can form a covalent bond with the surface of the substrate to attach the copolymer to the substrate and the epoxy group can form a covalent bond with the target molecule.